

21st Century Teaching Methodologies to enhance the Physics-I Course Effectiveness, Student's Learning Outcomes and Assessments

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ABSTRACT:

Physics-I (PHYS 301) is an Elementary General Physics course required for majors of non-engineering or non-science disciplines at Tuskegee University. The content of Physics-I is Algebra based and the course primarily focused on acquiring knowledge on Physical units and measurements, motion in 1D, 2D, dynamics, Newton's laws of motion, circular motion, work, energy, momentum, rotational dynamics and fluids. Students enrolled in the course often struggle to understand Physics concepts, derivation of equations and problem solving due to their non-science background and limited knowledge of how to approach Physics problems. A strong commitment and collaboration between Physics department and Tuskegee- Center for Academic Excellence and Innovative Learning (T-CAEIL) is very noticeable catalyst for the enhancement of course effectiveness and student learning outcomes since Fall 2012. The partnership provides students' centric platforms in terms of course enrichment activities such as peer tutoring, focused exam study sessions, fundamental workshops, Smarthinking/Plato enrichment tools, STEM workshops, pre-/post- tests, i-Clicker-based classroom interaction, quizzes, classroom demos which are tailored to the Physics-I course per semester. Analyses and assessments of the 21st century teaching methodology tools have demonstrated not only to build the confidence level of students, but also improve their course grade performances. A case study for the 2013 fall semester student learning outcomes and assessments will be discussed to evaluate the effectiveness of Physics-I course at the four-year collegiate level.

21ST CENTURY TEACHING METHODOLOGIES TO ENHANCE THE **PHYSICS-I** COURSE EFFECTIVENESS, STUDENT'S LEARNING OUTCOMES AND ASSESSMENTS

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Tuskegee University, Tuskegee, AL

AAPT Alabama Chapter Annual Meeting

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PHYSICS I - PHYS 301

- ❖ Algebra based
Introductory Physics Course
(3 Cr. Hrs; 3 Contact Hrs.)

- ❖ Units & Measurements,
Motion in 1D & 2D, Work,
Energy, Momentum, Circular
Motion, Statics/Fluids

- ❖ Math 107 or equivalent
course as pre-requisites

- ❖ Students from OT, Biology,
Computer Science,
Architecture, Animal Science,
Political Science, Elementary
Education, Chemistry

Faculty/T-CAEIL Staff

Course Activities

Assessments &
Learning Outcomes

Next Step

PHYSICS FACULTY

DR. SESHA S. SRINIVASAN

DR. ZENGJUN CHEN

DR. MOSES NTAM

DR. P.C. SHARMA

T-CAEIL STAFF

MS. SHERRY KING

MS. NIKASHA JONES

DR. ROZLYN CHAMBLISS

CONSULTATION & SUPPORT

DR. DAVID BAAH

TCAEIL PEER STAFF

MS. LEAH SANKS

MS. KENDRA EDOZIE

MR. SAMMIE ELY III

MR. DAVID YARBOROUGH

COURSE ACTIVITIES

PRE-TEST ASSESSMENTS

(Plato) ✓

POST-TEST ASSESSMENTS

(Plato) ✓

**PLATO/SMARTHINKING
TUTORIAL** ✓

**T-CAEIL EXAM STUDY
SESSIONS** ✓

**TCAEIL AWARENESS
SESSIONS** ✓

**PHYSICS/MATH FUNDA-
WORKSHOPS** ✓

I-CLICKER

PARTICIPATIONS ✓

**PHYSICS CLASSROOM
DEMONSTRATIONS**

TCAEIL TUTORIALS

SURVEY ASSESSMENTS

**INSTRUCTORS' OFFICE
HOURS AT TCAEIL** ✓

**TCAEIL-PHYSICS WEEKLY
MEETINGS**

ANALYSIS & EVALUATIONS



BACK 2 BASICS – FALL 2013

2013 PHYSICS ENRICHMENT WORKSHOPS

WORKSHOP 1: UNIT CONVERSIONS – DR.
MOSES NTAM

WORKSHOP 2: TRIGNOMETRY & VECTORS –
DR. ZENGJUN CHEN

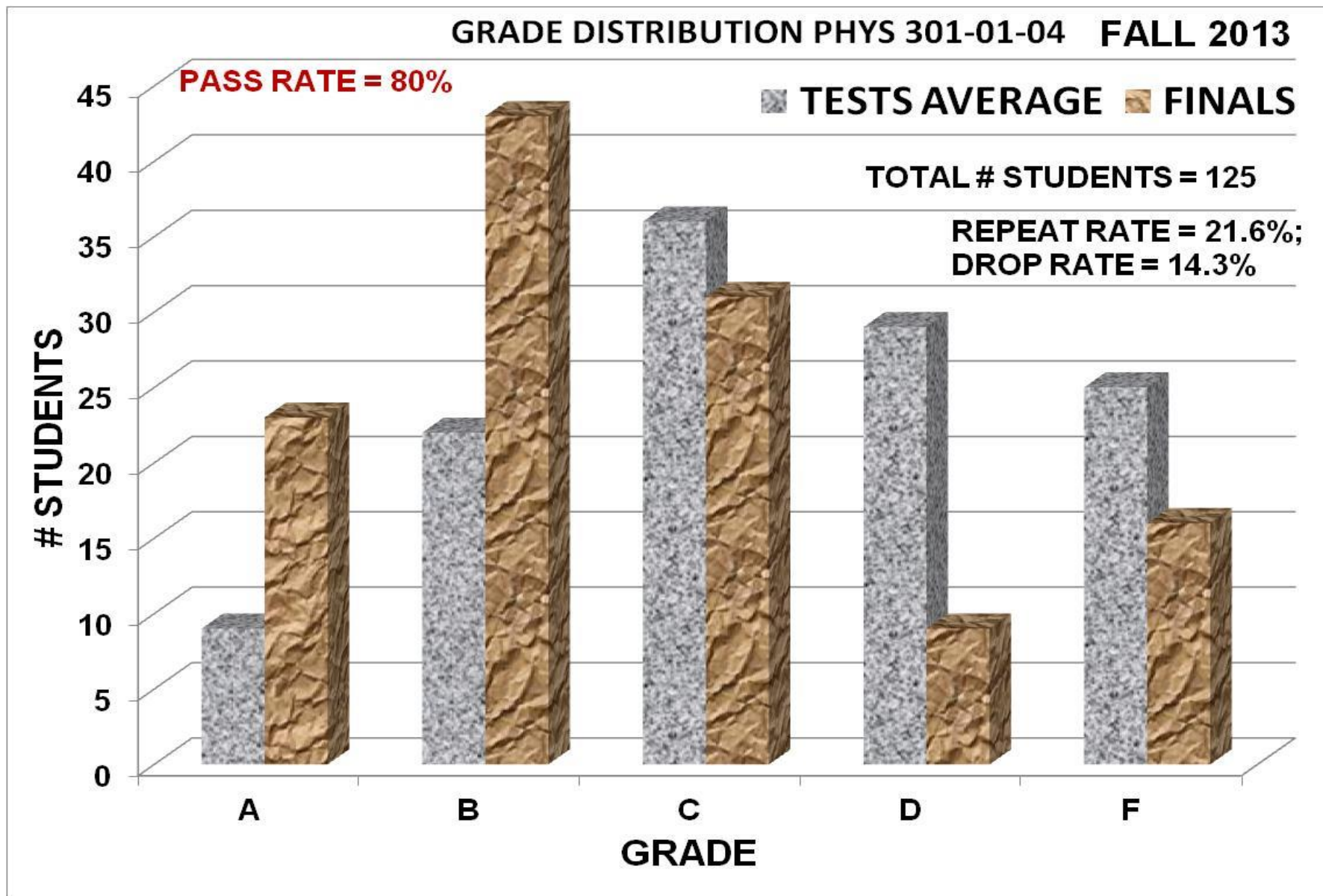
WORKSHOP 3: MANIPULATING EQUATIONS –
DR. SSHA SRINIVASAN

COURSE STATISTICS

ITEM DESCRIPTION	SEMESTER BASIS			
	FA'12	SP'13	SU'13	FA'13
STUDENTS ENROLLED	91	68	21	125
REPEAT RATE	20%	23.5%	64.7%	21.6%
DROP RATE	21.2%	12%	9.5%	14.3%
PASS RATE	70.8%	60%	100%	80%

PHYS 301

GRADE DISTRIBUTION – FALL 2013



PLATO EDMENTUM LEARNING



Product Login



Study Island



PLATO Learning Environment®

PLATO Web Learning Network

PLATO® eduTest



EducationCity



Classes

Records



Edmentum Assessments



Reading Eggs



PLATO EDMENTUM LEARNING

Pre/Post
Test
Assessment

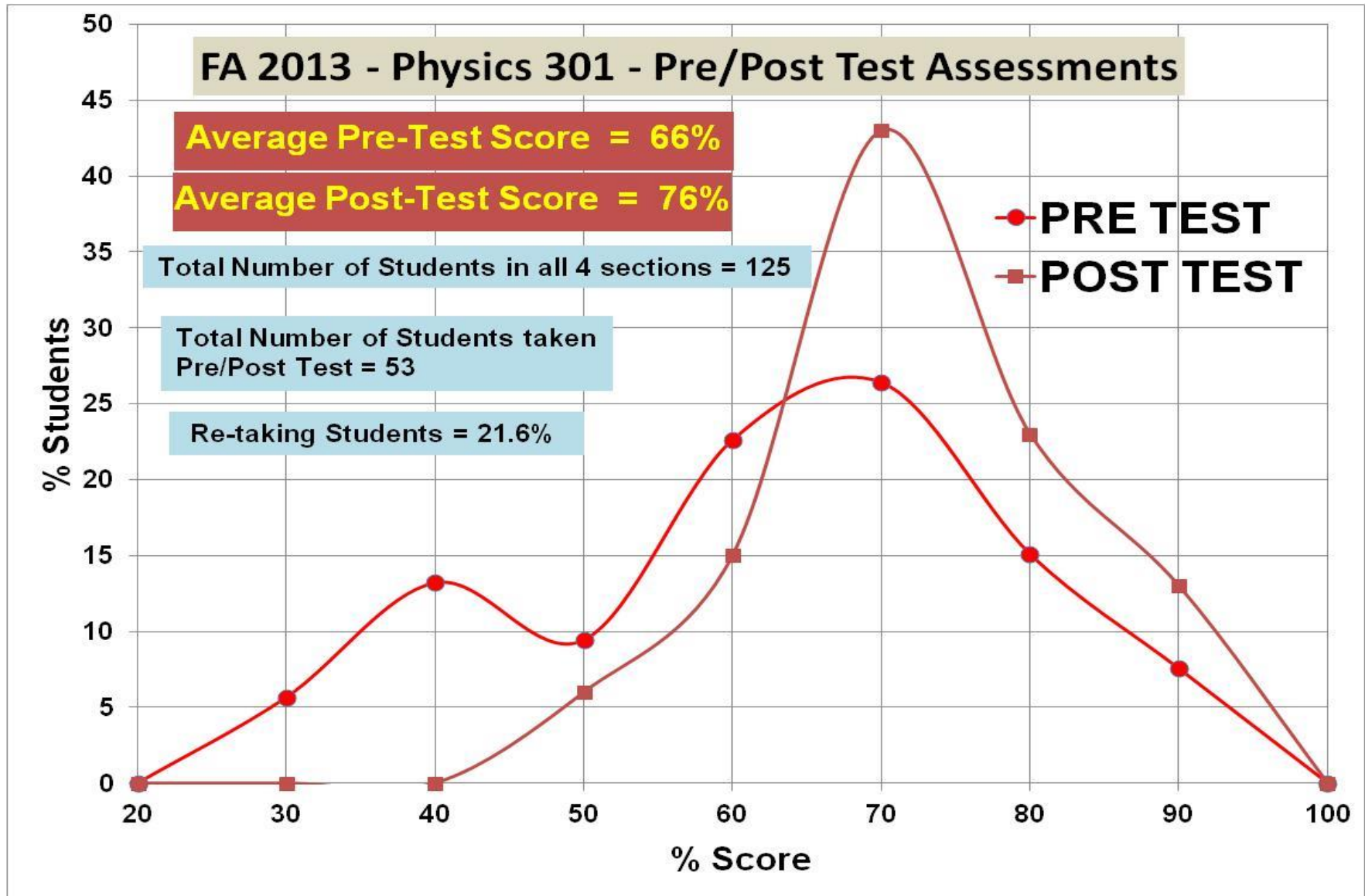
Items
Response
Report

Class Usage
Summary
Report

Graphic
Learners
Progress
Report

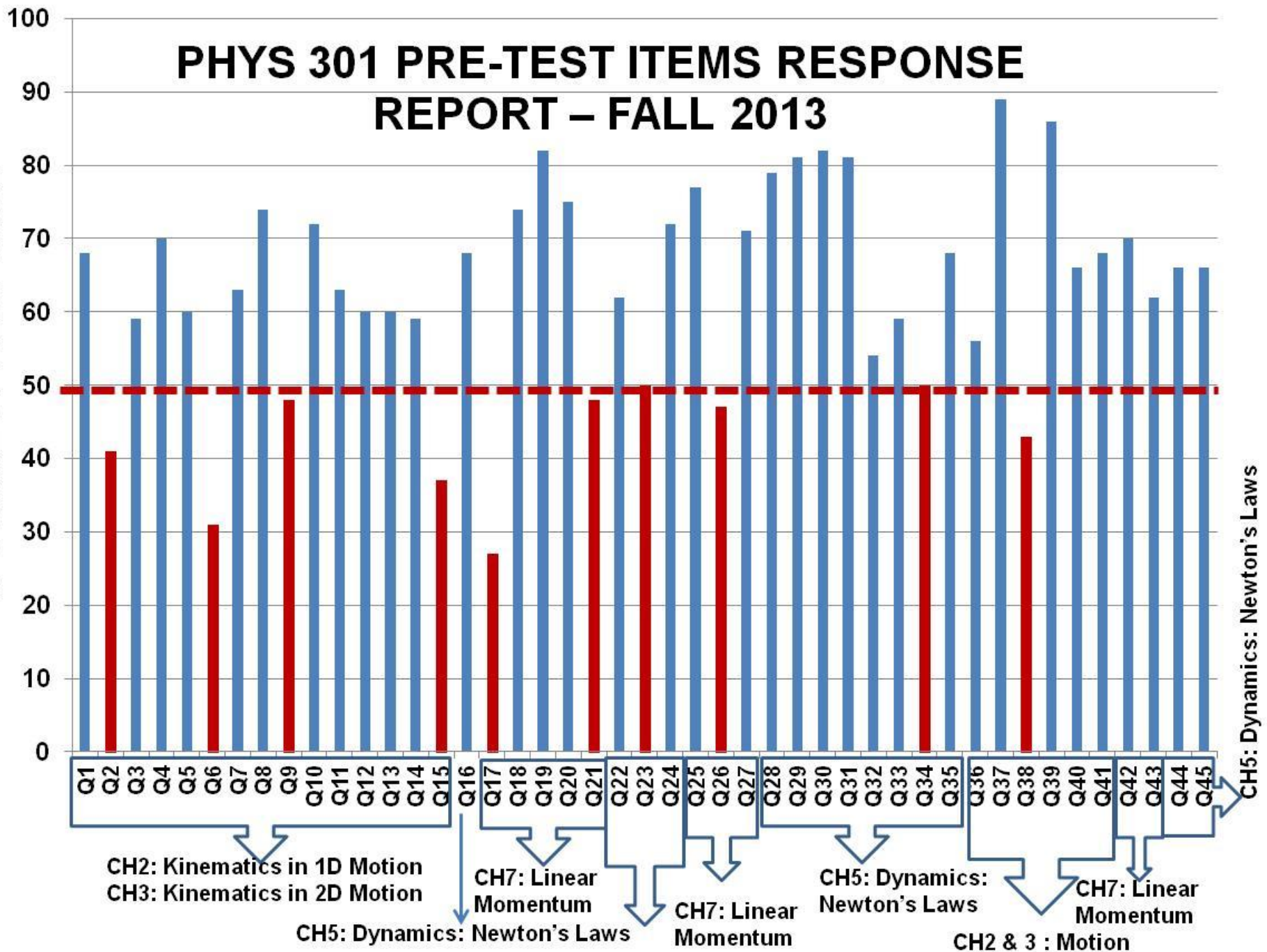
Discussion
Forum

PRE-TEST & POST-TEST ASSESSMENTS



PHYS 301 PRE-TEST ITEMS RESPONSE REPORT – FALL 2013

% CORRECT RESPONSE



ITEMS RESPONSE REPORT (CONTD...)

Question 6: ItemSerial #: 1132245960-bywm42

A rocket ship leaves the Earth's atmosphere. Its initial velocity is less than its final velocity. Which is this an example of?

(a) velocity

(b) negative acceleration

(c) positive acceleration [Answer]

Question 15: ItemSerial #: 1132246681-nrtp92

A trajectory has an initial velocity of 1,000 meters per second, and 5 seconds later, it has a velocity of 500 meters per second. Which is the acceleration of the trajectory?

(a) -100 meters/second/second in the same direction of travel [Answer]

(b) 100 meters/second/second in the same direction of travel

(c) -300 meters/second/second in the opposite direction of travel

Question 17: ItemSerial #: 1132250256-cwba23

Which is the momentum of a 100 kilogram boulder rolling south down a hill at a velocity of 5 meters per second?

(a) 20 kilogram meters per second south

(b) 500 kilogram meters per second north

(c) 500 kilogram meters per second south [Answer]

CLASS USAGE SUMMARY REPORT

Class Usage Summary Report

Date Range: 8/1/2013 1:00:00 AM - 12/11/2013 11:59:59 PM

Total Time on Task for all Classes: 774:03:38

Class	Instructor	Learners Enrolled	Learners Who Made Progress	Total Time on Task	Total Time in System
<i>Tuskegee University</i>					
PHYS.0301.01.13FA	Srinivasan, Sesha; Ntam, Moses;	33	33	134:15:03	148:58:17
PHYS.0301.02.13FA	Srinivasan, Sesha; Ntam, Moses;	36	36	235:12:18	270:32:49
PHYS.0301.03.13FA	Chen, Zengjun; Srinivasan, Sesha;	40	40	284:12:21	355:11:55
PHYS.0301.04.13FA	Srinivasan, Sesha;	32	32	120:23:56	160:06:48

TOTAL TIME ON TASK = 774:03:38

Pre-Test

Post-Test

Tutorial Module Mastery

Discussion Forum

PLATO EDMENTUM LEARNING

Tuskegee University

Account Options ▼

Welcome, Sessa



Home



Classes



Assignments



Content



Reports



Communication Administration

Time Zone: CST / UTC - 6

Home :: Assignments :: Learner Progress Summary



Learner Progress Summary

This report provides a summary of the performance of all learners with this assignment.
Select a learner's name to see his or her individual Learner Progress Details.
Select the Manage link to manage this assignment.

Class Assignments: SP14-PHYS301-PRE TES ▼

SP14-PHYS301-PRE TEST ASSESSMENT [Manage]

Refresh Data

This page last updated at 10:32:25 PM on 4/4/2014

Assigned Content: SP14-PHYS301-PRE-TEST ASSESSMENT

Assigned By: Srinivasan, Sessa
Class: TCAEIL Tutors

Learner	Completion	Completion Date	Due Date	Tries	First Use Date	Last Use Date	Time on Task (HH:MM:SS)
Gupta, Raju		02/09/2014	02/10/2014	1	02/09/2014	02/09/2014	00:41:37
Keel, Joanie		02/06/2014	02/10/2014	2	02/06/2014	02/06/2014	00:39:16
Sanks, Leah		02/10/2014	02/10/2014	1	02/10/2014	02/10/2014	00:17:33
Smith-Washington, Akili		02/10/2014	02/10/2014	3	02/10/2014	02/10/2014	00:26:04






GRAPHIC LEARNERS PROGRESS REPORT

Graphic Learner Progress Report

Tuskegee University

POLITICAL SCIENCE MAJOR



Learner(s)	Location(s)	Class	Course	Instructor(s)	Total Modules	Modules Mastered*	Percent of Modules Mastered	Total Time on Task	Average Module Mastery Time	Status Bar (The Status Bar visually represents the Percent of Modules Mastered column data)
STUDENT A	Tuskegee University	PHYS.0301.04.13FA	Chapter 3 - Kinematics 2D - Vectors - Projectile Motion	Srinivasan, Sessa	1	1	100%	00:16:03	00:16:03	0%  100%
STUDENT A	Tuskegee University	PHYS.0301.04.13FA	CHAPTER 3 - KINEMATICS IN 2 DIMENSIONS - MODULE MASTERY	Srinivasan, Sessa	5	5	100%	03:59:40	00:47:56	0%  100%
STUDENT A	Tuskegee University	PHYS.0301.04.13FA	Chapter 4 - Tutorial Assignment	Srinivasan, Sessa	6	4	67%	00:27:50	00:06:58	0%  67%
STUDENT A	Tuskegee University	PHYS.0301.04.13FA	Chapter 5: Circular Motion and Gravitation - TUTORIAL	Srinivasan, Sessa	1	1	100%	00:05:09	00:05:09	0%  100%
STUDENT A	Tuskegee University	PHYS.0301.04.13FA	Chapter 6 - Work, Energy and Power	Srinivasan, Sessa	8	4	50%	00:47:07	00:11:47	0%  50%

TESTS/FINALS	GRADE
TEST 1	D
MID TERM	C
FINAL EXAM	A

ASSESSMENTS	% SCORE
PRE-TEST	70%
POST-TEST	90%
GAIN	+20%

GRAPHIC LEARNERS PROGRESS REPORT

Graphic Learner Progress Report

Tuskegee University

OCCUPATIONAL THERAPY MAJOR (THIRD TIME COURSE REPEATER)



Learner(s)	Location(s)	Class	Course	Instructor(s)	Total Modules	Modules Mastered*	Percent of Modules Mastered	Total Time on Task	Average Module Mastery Time	Status Bar (The Status Bar visually represents the Percent of Modules Mastered column data)
STUDENT B	University	13FA	Assignment	Sesha	0	0	0%	02:04:02	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	Chapter 5: Circular Motion and Gravitation - TUTORIAL	Srinivasan, Sesha	1	0	0%	00:00:00	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	Chapter 6 - Work, Energy and Power	Srinivasan, Sesha	8	0	0%	00:00:00	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	Chapter 7 - Momentum, Collision and Impulse	Srinivasan, Sesha	8	0	0%	00:00:00	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	PHYS 301 Pre Test Assessment	Srinivasan, Sesha	2	0	0%	00:33:41	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	PHYSICS 301 Pre Test Assessment	Srinivasan, Sesha	2	0	0%	00:00:00	00:00:00	0% <input type="text"/> 0%
STUDENT B	Tuskegee University	PHYS.0301.02.13FA	POST TEST ASSESSMENT	Srinivasan, Sesha	26	0	0%	00:50:28	00:00:00	0% <input type="text"/> 0%

TESTS/FINALS	GRADE
TEST 1	F
MID TERM	F
FINAL EXAM	D

ASSESSMENTS	% SCORE
PRE-TEST	35%
POST-TEST	50%
GAIN	+15%

PLATO DISCUSSION FORUM

Unit 4: Discussion - Energy and Momentum

The US government wants to allocate billions of dollars in the next 10 years to help assure our future energy security. The funds will be spread among a variety of possible energy resources. Where do you think the government should put the greatest support: solar energy, wind energy, clean coal, oil exploration, gas exploration, or a combination of sources? Are there other efforts that should be explored? Support your position with cited information for both questions.

[Respond to original topic](#)

This activity is waiting on instructor for score

Find Learner: Hogan

Now Viewing: Clarence-Austin, Hogan [score learner](#)

Search Result for :
Hogan, Clarence-Austin

Date Range Filter:

From: 11/01/2013
To: 01/06/2014

0 Comments newest on top

Top Level Posts
No learner posts found

Replies to Posts
No learner posts found

Top Level Posts

0 Replies

Terrance Pierce - December 10 15:41PM CST

The US government should use the money towards solar power. It's our greatest unlimited natural resource. It costs nothing and can be used for a pl...

[block comment](#)

[Show more of this comment](#)

[View conversation](#)

1 Replies

Myjoy Chain - December 10 02:20AM CST

GAS GAS GAS!!!! Im grateful that my car only takes 30 to fill up, sometimes even less. other people are sadly not as fortunate. putting money into ...

[block comment](#)

[Show more of this comment](#)

[View conversation](#)

0 Replies

Jasmine Bailey - December 5 00:26AM CST

I think that they should all be supported like a combination because it is not like you can just abandon one. They are all still needed to make the...

[block comment](#)

[Show more of this comment](#)

[View conversation](#)

Jasmine Robertson - November 16 20:39PM CST

I think that the government should put the greatest support to wind energy and solar energy. The

SMARTHINKING USAGE REPORTS

FALL 2013



By Subject

Subject	Sessions	Minutes
Physics	7	160
Total in Minutes	7	160
Total in Hours	7	2.67

By Assessment

Assessment	Minutes Per Assessment	Number Taken	Minutes
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Student Usage Detail

Student	User Name	Email Address	Usage Date	Subject	Minutes
Terrance Pierce	TUU1_tp0715297	TPierce5297@mytu.tuskegee.edu	2013-12-10 13:30:15	Physics	27
Terrance Pierce	TUU1_tp0715297	TPierce5297@mytu.tuskegee.edu	2013-12-07 16:12:00	Physics	27
Terrance Pierce	TUU1_tp0715297	TPierce5297@mytu.tuskegee.edu	2013-12-07 15:44:20	Physics	22
Moses Ntam	TUU1_mn0769431	mn0769431@mytu.tuskegee.edu	2013-11-20 17:13:40	Physics	14
Myjoy Chain	TUU1_mc0744810	mchain4810@mytu.tuskegee.edu	2013-12-07 15:54:28	Physics	11
Khiry Jones	TUU1_kj0614469	KJones4469@mytu.tuskegee.edu	2013-12-10 23:43:54	Physics	36
Khiry Jones	TUU1_kj0614469	KJones4469@mytu.tuskegee.edu	2013-12-10 23:08:44	Physics	23



smarthinking
1 / 1

Whiteboard

A 60 kg sheet hangs from a massless clothesline. the clothesline on either side of the sheet makes an angle of 3.5 degrees with the horizontal. Calculate the tension in the clothesline on either side of the sheet. Why is the tension so much greater than the weight of the sheet?

Let me go through it meanwhile please show your work.

$mg = Ft \sin 3.5 + Ft \sin 3.5$ ✓
 $mg = Ft (\sin 3.5 + \sin 3.5)$ ✓
 $Ft = (6 * 9.8) / 2 \sin 35$ ✓
 $Ft = 48N$ ✓

yes, it is correct!

Is this right?
Oh yea..lol

is there any diagram given ?
yes can you draw it here please ?

okay :)

can you give reason why it is much more than weight of sheet ?
I can't...my problem is that I can only remember the equations but its hard for me to explain it.

It is simple, the reason is ' the horizontal component of tension balances each other and hence they go in vain.' hence, the tension is more than weight .

ok...thanks..it is is it okay ?
welcome :)

do you have another problem ?

I have a question about stress and strain.

I missed the class that we went over it. Is there a set equation for them?

no, it is just the regular force equations. We just need to apply them with given situation.

A marble column of a cross-sectional area $1.2m^2$ supports a mass of 25,000 kg. a) What is the stress within the column? b)What is the strain?

$=mg/A$ ✓
 $=(25000*9.8)/1.2$ ✓
 $=204167$ or $2.042 * 10^5$ ✓

Yay correct!

This is stress, please calculate strain now..

ummmm...

$=(2.042 * 10^5) / 50 * 10^9$? ok ✓
 $=4.1 * 10^{-6}$? ✓

Thank you!!!!

welcome :) okay :)
I think thats it,

Hi khiry, welcome to Smarthinking.
I am Suyog here :)

Hello. Thanks for taking the time to help me
welcome :)

Thanks for using Smarthinking.
Please visit us again.
have a nice time.
Bye for now.....

Good bye..thanks again



smarthinking
1 / 2

Whiteboard

A force of 6.00 newtons on a car's bumper makes an angle of 28.5 degrees with the ground. What is the vertical component of this force vector?

Hi, Welcome to Smarthinking. Rajiv here.

Hi, Im Terrance Any work so far on the problem?

No

If we are given magnitude of vector with angle, we can find its vertical and horizontal components using trigonometry.

$F_x = F \cos \theta$ (Horizontal component)
 $F_y = F \sin \theta$ (Vertical component)

im back, sorry

Can you now find its vertical component using that equation?

The F_y equation? yes.

let me try now ok.

Do you have scientific calculator along with you?

yes

1 sec

2.86 newtons? right!

thanks!

You are welcome!



PARTICIPATION

Session 8/30/13 Summary Report : Elementary General Physics-PHYS 301-04

Date **8/30/2013**

Number of Students: **17**

Total Questions: **3**

Total Points Available: **1**

Session Average: **1.00**

Questions Asked: **3**

Questions Deleted: **0**

Participation Points Available: **1**

Performance Points Available: **0**

AP = Anonymous Polling.

Session Average = Average calculation based only on students who voted in this session.

Average Score per Question: Average calculation based only on students who responded to this question.

Question Title	Time Started	Time Stopped	Number of Responses	Maximum Score	Average Score
Question 1	11:12:19 AM	11:12:46 AM	16	0.00	0.00
Question 2	11:13:03 AM	11:13:20 AM	14	0.00	0.00
Question 3	11:13:42 AM	11:14:08 AM	15	0.00	0.00

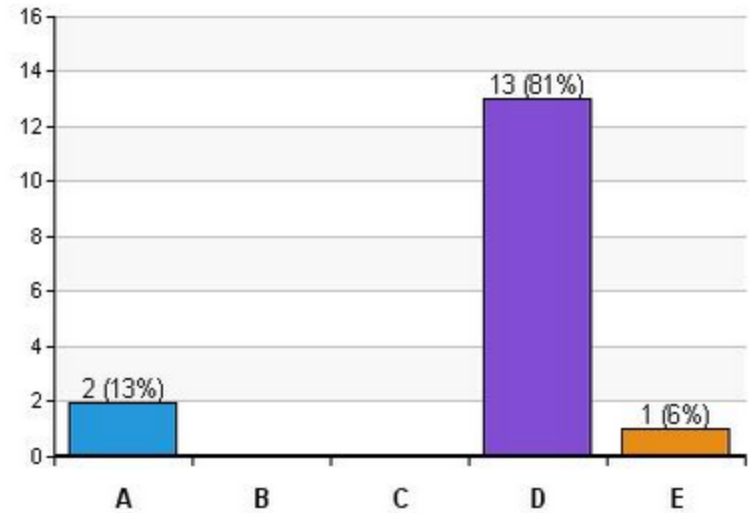
Session 8/30/13 Summary Report : Elementary General Physics-PHYS 301-04

Use i-Clicker2 to answer Questions



Micrometer is

- A. 10^{-1} m
- B. 10^{-2} m
- C. 10^{-3} m
- D. 10^{-6} m

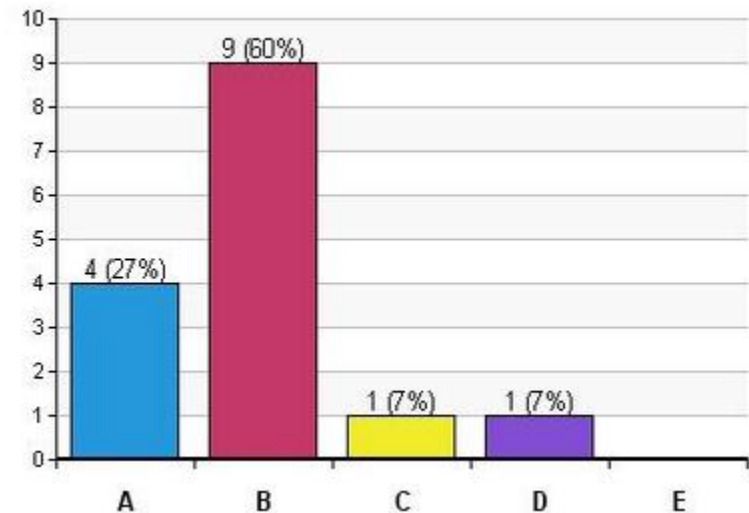


Use i-Clicker2 to answer Questions



1 meter is

- A. 1000 cm
- B. 1000 mm
- C. 10 km
- D. 100 dm





Create and manage formal groups of students to collaborate on work.



Wikis

Hide Link

Create and manage wikis for Courses and Course Groups



Journals

Hide Link

Create and manage journals that can be assigned to each user in a group for the purposes of private communication with the instructor.



WileyPLUS

WileyPLUS

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Open the complete eTextbook for your course. Start using WileyPLUS for your assignments.



McGraw-Hill Higher Education

Hide Link

Access and Manage McGraw-Hill products for this course through Blackboard.



i>clicker Remote Registration

Hide Link

Register your i>clicker remote ID



My Career

Hide Link

internships.com

Access jobs, internships, and career tools from within Blackboard - powered by Internships.com

*Pre/Post Test
Admin*

Plato Module
Mastery

**Lessons
Learned**

Rubrics / Metrics

Restructure
Syllabus

NEXT STEP - PLAN OF ACTION – SP'14

OBJECTIVES	STUDENTS LEARNING OUTCOMES	MEASUREMENTS
<p>Physics 301 is an algebra based Physics course designed for non-engineering majors.</p> <p>In this course, students will learn about the “basics” of Physics, how to describe and analyze motion, how forces interact with matter, and how to further describes these interactions with the aid of the concepts of energy and momentum.</p> <p>Objective of the course also to use Physics concepts in students’ own disciplines to solve problems</p> <p>Explore and apply the laws of dynamics – force of motion.</p>	<p>Understand the fundamental units, their conversions and significant figures.</p> <p>Solve problems using mathematical derivations and physics principles.</p> <p>Mathematically describe and analyze linear and circular motions.</p> <p>Students will be able to use Physics laws to solve problems of real time applications systematically and accurately.</p>	<p>Exams – quantity</p> <p>Pre/Post – quantity</p> <p>i-Clicker – quantity</p> <p><u>T-CAEIL</u></p> <p>Study sessions – quality</p> <p>Tutoring – quality</p> <p>Evaluations – quality</p> <p>Plato/Smarthinking - quantity</p>

NEXT STEP – GRADING WEIGHT CHANGE

FALL 2013

Tests (2 Best)	60%
Finals	35%
Attendance	5%
Total	100%
Extra Credit	5%

*Back 2 Basics, Pre- & Post
Assessment,
Plato/Smarthinking Tutorial*

SPRING 2014

Tests (2 Best)	50%
Final Exam	30%
Participation	
i-Clicker	5%
T-CAEIL	5%
Assessments	
Plato	4%
Smarthinking	4%
Pre & Post Test	2%
Total	100%
Extra Credit	0%

TCAEIL PHYSICS STUDY SESSION



Ms. Leah Sanks, Junior, Physics Major tutoring during the exam study session

PRE- & POST- TEST ADMINISTRATION



PHYS 301 STUDENTS TAKING PLATO PRE- & POST- TEST AT T-CAEIL LABS

TCAEIL AWARENESS



Ms. Sherry King, Director introducing T-CAEIL activities in the PHYS 301 classroom



THANK YOU
QUESTIONS?

